It may interest such of our readers as are conversant with the German language to know that in the course of the present month Dr. Ernst von Hesse Wartegg will deliver a lecture at the German Athenæum (93, Mortimer Street, W.), entitled "Das Leben der Beduinen." The secretary of the institution will furnish all particulars regarding exact date and admission to the lecture on application by letter.

After the example of the German and Austrian Alpine Clubs, a Bohemian Mountain Club is now in course of formation.

The authors of Sweden and Finnland have edited a festive paper, "Nordostpassagen," in honour of Prof. Nordenskjöld's return, which deserves high commendation, both with regard to text and illustrations. It is published by C. E. Fritze, of Stockholm.

In a letter from M. Berlioux, read at the Paris Academy of Sciences on May 31, the writer attempts to prove from the last expedition of Dr. Rohlfs in the Eastern Sahara the marvellous correctness of Ptolemy's Tables.

It is stated that Col. Gordon, who has resigned his post on the staff of Lord Ripon, is to proceed to Zanzibar to join the Belgian African exploring expedition.

The question of the speedy completion of the Ordnance Survey came up in the House of Commons last Friday, when there was an almost unanimous consensus of opinion that Government ought at once to advance as much money as was necessary to complete the work. The reply of Mr. Adam and Mr. Gladstone was virtually a *non possumus*. It was not so much the difficulty of advancing the money as of obtaining the necessary amount of skilled labour to carry on the work under pressure. At the present rate the survey cannot be completed for eighteen years.

DR. SIEMENS' NEWEST ELECTRICAL RESULTS

A PAPER was read on Thursday last before the Society of Telegraph Engineers by Dr. Siemens, F.R.S., upon "Recent Applications of the Dynamo-Electric Current to Metallurgy, Horticulture, and the Transmission of Power." The author first referred to the inaugural address which he had given before the Society on his election to his second presidency, wherein he drew attention to the applicability of the dynamo-electric current to purposes beyond the range of what electricity had theretofore been employed in effecting. On the present occasion he corroborated his statements by a reference to recent experimental results of his own.

The first part of the paper had reference to an electric furnace. This furnace consists of any ordinary crucible of plumbago or other highly refractory material, which is placed in a metallic jacket or outer casing, the intervening space being filled up with pounded charcoal or other bad conductor of heat. A hole is pierced through the bottom of the crucible for the admission of a rod of iron, platinum, or dense carbon, such as is used in electric illumination. The cover of the crucible is also pierced for the reception of the negative electrode, by preference a cylinder of compressed carbon of comparatively large dimensions. At the end of a beam supported at its centre is suspended the negative electrode by means of a strip of copper, or other good conductor of electricity, the other end of the beam being attached to a hollow cylinder of iron free to move vertically within a solenoid coil of wire, presenting a total resistance of about fifty units or ohms. By means of a sliding weight the preponderance of weight of the beam in the direction of the solenoid can be varied so as to balance the magnetic force with which the hollow iron cylinder is drawn into the coil. One end of the solenoid coil is connected with the positive, and the other with the negative pole of the electric arc, and, being a coil of high resistance, its attractive force on the iron cylinder is proportional to the electromotive force between the two electrodes, or, in other words, to the electrical resistance of the arc itself.

An automatic adjustment of the arc thus arises of great importance to the attainment of advantageous results in the process of electric fusion; without it the resistance of the arc would rapidly diminish with increase of temperature of the heated atmosphere within the crucible, and heat would be developed in the dynamo-electric machine to the prejudice of the electric furnace. The sudden sinking or change in electrical resistance of the material undergoing fusion would, on the other hand, cause sudden increase in the resistance of the arc, with a likelihood of its extinction, if such self-adjusting action did not take place.

Another important element of success in electric fusion consists in constituting the material to be fused the positive pole of the electric arc. It is well known that it is at the positive pole that the heat is principally developed, and fusion of the material constituting the positive pole takes place even before the crucible itself is heated up to the same degree. This principle of action is of course applicable only to the melting of metals and other electrical conductors, such as metallic oxides, which constitute the materials generally operated upon in metallurgical processes. In operating upon non-conductive earth or upon gases it becomes necessary to provide a non destructible positive pole, such as platinum or iridium, which may, however, undergo fusion and form a little pool at the bottom of the crucible.

In this electrical furnace some time, of course, is occupied to bring the temperature of the crucible itself up to a considerable degree, but it is surprising how rapidly an accumulation of heat takes place. In working with the modified medium-sized dynamo machine, capable of producing thirty-six webers of current with an expenditure of four horse-power, and which, if used for illuminating purposes, produces a light equal to 6,000 candles, I find that a crucible of about twenty centimetres in depth, immersed in a non-conductive material, is raised up to a white heat in less than ¼ an hour, and the fusion of one kilogram of steel is effected within, say, another ¼-hour, successive fusions being effected in somewhat diminishing intervals of time. It is quite feasible to carry on this process upon a still larger scale by increasing the power of the dynamo-electric machine and the size of the crucibles.

It was shown by means of a calculation that this furnace utilises $\frac{1}{3}$ of the horse-power actually expended, and as the efficiency of a good steam-engine is $\frac{1}{5}$, that of the electric furnace is $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$. Now as it takes theoretically 450 heat units to melt 1 lb. of steel, there will be required actually $450 \times 15 = 6{,}750$ units in working with the electric furnace, or about the heat-energy residing in a pound of ordinary coal. To melt a ton of steel in crucibles in the ordinary air-furnace as practised at Sheffield, 2½ to 3 tons of best Durham coke are consumed. A ton of coal is consumed per ton of steel produced if the regenerative gas furnace is used for heating the crucibles, whilst to produce steel in large quantities on the open hearth of this furnace about 12 cwt. of coal per ton of steel suffice. The electric furnace may therefore be considered as economically superior to the ordinary air-furnace, and, barring some incidental losses not included in the calculation, is nearly equal to the regenerative gas-furnace as far as economy of fuel is concerned. In favour of the electric furnace is an almost unlimited temperature, easy application, a neutral atmosphere within the crucible, and the circumstance that the heat within the crucible is greater than that external to it, whereas in ordinary fusion the temperature of the crucible is higher than that of metal within.

On the occasion of reading the paper a pound of broken files was melted in a cold crucible by means of a current of 72 webers in fifteen minutes, and cast in a liquid state, a second casting being effected in eight minutes. These and other brilliant successes of the new apparatus were hailed with ringing cheers.

In the second portion of the paper, referring to electro-horticulture, the author explained the experiments by means of which he has come to the conclusion that electric light produces the colouring matter chlorophyll in the leaves of plants, that it aids their growth, counteracts the effects of night frosts, and promotes the setting and ripening of fruit in the open air. It appears, further, that, at all events for certain short periods, plants do not require a period of rest during the twenty-four hours, but make increased and vigorous progress if subjected during daytime to sunlight and to electric light at night. These observations on combined sun and electric light agree with those made by Dr. Schübeler of Christiania, who found as the result of continued experiment in the north of Europe, during an Arctic summer, that plants, when thus continuously growing, develop more brilliant flowers and larger and more aromatic fruit than when under the alternating influence of light and darkness. As Dr. Siemens has found that under the influence of electric light plants can sustain increased stove heat without collapsing, he is of opinion that forcing may be effected in an electric stove or enclosure containing an electric light, and that horticulturists may thus grow fruit of excellent aroma and flowers of great brilliancy without immediate solar aid. To test what

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can be done practically the author has put down a steam-engine and boiler at his country residence near Tunbridge Wells, and intends to test the principles involved upon a working scale during the winter. The steam-engine which drives the dynamo-electric machine during the night for the purpose of giving light is to be employed during the day in transmitting power through an electric conductor to the farm for the purpose of carrying on small farming operations such as turnip, chaff, and wood-cutting, &c. Another interesting question which Dr. Siemens has set himself to answer is to determine which portion of the rays constituting white light is efficacious in producing chlorophyll, starch, and woody fibre, and which in effecting the ripening of fruit. For this purpose arrangements are in preparation to distribute the spectrum of a powerful electric light in a darkened chamber over a series of similar plants exposed *seriatim* to the actinic, light-giving, and thermal portions of the spectrum. Some experiments have been made with solar light in this direction, but no very conclusive results could be obtained, because the short periods of time during which the solar spectrum can be maintained steadily in the same place are so short that the effects produced upon vegetation have not been of a sufficiently decided character; whereas, with the aid of electric light, the same spectrum may be kept on steadily for a series of days without intermission. The author referred shortly to the lamp which he designed for this purpose, having a focus unchangeable in space, and without obstruction to the rays of light falling downward. There is no clockwork; the carbons are pressed forward either by their own weight or by the force of springs, the motion being checked by an abutment against which the carbon presses at the junction of its cylindrical with its conical portion. This is at a distance of ⅓ inch to ½ inch from the arc centre, when the heat is sufficient to cause the gradual decomposition of the carbon, without being high enough to fuse or injure the metal abutment.

In the third portion of the paper the author refers to the application of electricity as a means of mechanical propulsion. He described the electric railway designed by Dr. Werner Siemens, of Berlin, and tried at a local exhibition held in that city. The rails were insulated from the earth by wooden sleepers, and were in electrical connection with a dynamo-electric machine worked by steam power at the station. A magneto-electric machine on the driving carriage was so fixed and connected with the axle of one pair of wheels as to give motion to the same, the driving axle being severed electrically by the introduction of an insulated washer. A current of electricity is thus passed along one rail to work the magneto-electric machine on the driving carriage, and back by the other rail to the stationary machine on the ground. The author anticipates a large application of the electric railway to adits in mines, to locomotives between neighbouring places, and to tunnels. In fact it is seriously contemplated to apply this system at the St. Gothard tunnel, where the large turbines are available which have been employed in the boring operations.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—In their latest-issued series of statutes for the University of Cambridge, the Commissioners maintain Easter as the boundary between the University Lent and Easter terms, and require three-fourths of each term to be kept by residence. The degree of Bachelor in Surgery is added to the list; but the permission to give degrees to peers and sons of peers who come to the University in youth is limited to the B.A. degree, and the University may prescribe for their examinations and residence by grace. Titular degrees in any of the seven faculties of Arts, Law, Medicine, Surgery, Science, Letters, or Music may be granted to foreigners of distinction and to British subjects who are of conspicuous merit, or who have done good service to the State or to the University. Complete honorary degrees, with right of voting, may be given to those who obtain some University office after residing three terms in the University.

The Demonstrator of Anatomy will superintend a class for Practical Histology during the next long vacation, beginning July 1; another class will be held for Human Osteology. The Cavendish Laboratory also will be open for practical work.

Notice has been given by the Board of Natural Science Studies that next June (1881) there will be a practical examination in all the subjects of the examination in the first part of the Natural Sciences Tripos.

The recent memorials concerning the academical encouragement of the higher education of women are to be considered and reported on by a syndicate consisting of the Vice-Chancellor, Drs. Bateson, Phear, Westcott, and E. C. Clark, Professors Cayley, Adams, Liveing, and Stuart, Messrs. G. F. Browne, Ferrers, E. W. Blore, R. Burn, H. Sidgwick, J. Peile, A. Austen-Leigh, and G. W. Prothero, to report before the end of Lent Term next.

The Sedgwick prize, given every third year for the best essay on some subject in geology or the kindred sciences, open to the competition of all graduates of the University who have resided sixty days during the twelvemonth preceding the day on which the essay must be sent in, has been awarded to Walter Keeping, Inceptor in Arts, of Christ's College. The subject of the essay is, "On the Fossils and Palæontological Affinities of the Neocomian Beds of Upware, Wicken, and Brickhill."

SIR JOHN LUBBOCK has been elected without opposition to represent London University in Parliament.

PROF. HENRICI, F.R.S., has been appointed to the Professorship of Applied Mathematics in University College, London.

GREAT importance has been given to the first session of the Superior Council of Instruction of France, composed of about fifty members, of whom forty have been nominated by the different classes of French teachers, from the Sorbonne to the humblest village school. A decree has granted to each of them a sum of 20 francs a day for the duration of the session, and travelling expenses. M. Jules Ferry opened the session by a speech in which he explained his views, and submitted to the new organisation a programme of reforms. This programme has been sent by the General Assembly to a special commission composed of fifty members appointed to report on it. M. Jules Simon has been appointed president of that commission. It is said that, although approving the general tendency of these reforms, the commission is resolved to protect Greek studies, which had been sacrificed in the Ministerial project. But it agrees to render the study of either the English or the German language an obligation from the admission to the school up to the end of the course of studies. The commission has held already three long sittings for determining these points. The discussion will be long in general sitting. For the first time in the history of France the University has her own parliament to deliberate on all the subjects relating to public instruction. None of these deliberations are to be binding on the Government. All the provisions of the laws are to be voted as formerly by the French Chamber of Deputies and Senate.

SCIENTIFIC SERIALS

THE *Bulletin of the Torrey Botanical Club* is now published in regular monthly parts, instead of at irregular intervals. The papers are of course chiefly of local interest, and that is especially the case with the three numbers which we have received for the current year, though now and then morphological notes by Mr. Meehan and others are of a wider scope. At all events the *Bulletin* gives us in this country a lively idea of the activity of botanical research on the other side of the Atlantic. Mr. W. R. Gerard gives a description and drawing of a fungus new to science, *Simblum rubescens*, belonging to the Phalloidei.

UNDER the new editorship of Mr. James Britten the *Journal of Botany* loses none of its interest. In addition to contributions to phyto-geography, and smaller articles of special interest to the workers in the critical botany of British plants, the following, which have appeared in recent numbers, may be mentioned as being of a wider scope:—Mr. J. G. Baker's Synopsis of the species of *Isoëtes*, a useful contribution to our knowledge of vascular cryptogams; a much-needed review of the British Characeæ (not yet completed), by H. and J. Groves; and the botany of the British Polar Expedition of 1875-6, by Mr. H. C. Hart, the naturalist to the expedition.

THE *Nuovo Giornale Botanico Italiano* continues to be supplied with good and useful papers in the various departments of botany. In the two numbers already published during the present year (vol. xii. Nos. 1 and 2) there are articles by several of the leading Italian botanists. The editor, Prof. Caruel, gives a list of fifty false genera or species of plants founded on teratological or pathological circumstances. In an article on the parasitism of fungi by A. Bertoloni, he divides the class of fungi into two great divisions, according to their mode of life. The

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